

Application No.: 09/770,296

Amendment Dated 1/19/05

Reply to Office Action dated 10/19/04

Amendments to the Drawings:

The attached sheets of drawings includes changes to Figures 1, 2, 3, 4, 6 & 7. New Figure 8 has been inserted. These sheets 1-7, replace sheets 1-7 currently on file.

Attachment: Replacement Sheets

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REMARKS

The Preliminary Amendment filed on January 29, 2001 does not appear to have been taken into account when examining the present application. A copy of the preliminary amendment, containing amended specification pages 2-6, 8, and 16, as well as claims 1-35 and new claim 36, is enclosed herewith.

Claims 1-36 having been submitted for examination, claims 1-3, 14, 19-24 and 30 are rejected under 35 USC 112, first paragraph, predicated on enablement and under 35 USC 112, second paragraph. Rejected under 35 USC 103 are claims 1-3 and 19-24, Spille '920 being applied, and claims 14 and 30 in view of the same reference together with Ten Kate. The remaining claims are objected to, and presumably substantively allowable.

Considering in turn the points raised by the Examiner:

1. The Preliminary Amendment filed on January 29, 2001 does not appear to have been taken into account when Examining the present application. A copy of the preliminary amendment, containing Claims 1-36, is enclosed herewith.
2. The title of the application has been amended as suggested by the Examiner.

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3. A replacement copy of the original Declaration is enclosed. The name of the inventor is Andrew Kevin MCPARLAND, as detailed on the application as published and as shown on the USPTO filing receipt. The signature of the inventor matches the printed name on the Declaration.

4. The drawings have been amended by the insertion of reference numerals, and corresponding amendments have been made to the description. These amendments do not constitute the addition of any new subject matter. Figure 7 has been amended to show the insertion of a synchronization sequence as explicitly described at page 17 line 12. Figure 8 has been newly inserted. This figure is a flow chart illustrating the detailed method steps by which digital data can be inserted into a digital audio data stream. These steps are explicitly described in the portion of the description between page 9, line 25 and page 11, line 17. The amendment of Figure 7 and the insertion of Figure 8 does not constitute the addition of subject matter.

The Examiner's comments in this section concerning obviousness are addressed at points 10-12 below.

6. Multiple dependencies have been removed from the claims in the preliminary amendment filed January 29 2001. See point 1 above.

8. The Examiner has objected that certain of the claims fail to comply with the enablement requirement. It is respectfully submitted that the invention, as defined by the claims, is described clearly and completely in the specification, and that the skilled reader would be able to put the invention into practice.

Generally speaking, the invention concerns the identification of portions of a main signal into which data can advantageously be inserted to cause substantially no impairment of that main signal. The description provides a number of examples of systems which use the invention, and details which portions of the signal might be identified in those examples.

A detailed explanation of one embodiment of the invention, including steps for identification of portions of the main signal and insertion of auxiliary data, is provided on pages 10 and 11 for example. However, it would be apparent to the skilled person, after having read the specification, that the inventive concept could equally be used in other embodiments to identify other portions of a main signal where data insertion will cause substantially no impairment.

9. As noted above, it is respectfully considered that the present claims as provided in the preliminary amendment dated January 29, 2001, are clear and concise and distinctly claim the subject matter for which protection is sought.

The assertion in the Examiner's report that "The only disclosed element capable of performing the desired method appears to be the analysis and synthesis filterbanks" appears to relate to the

enablement requirement, discussed above. Nevertheless, it is noted that the description clearly states in the paragraph spanning pages 2 and 3 for example, that insertion of data is based on the principles used in coding, and that therefore components for putting the invention into effect can be shared with components for coding and decoding.

Such components for coding and decoding, and indeed for a wide range of other analysis and signal processing including filterbanks, are well known to those skilled in the art. In fact, much signal processing can be performed by operating software on widely available workstations or even in certain cases a consumer PC.

The nature of the invention therefore, is such that it can be embodied in a wide variety of forms, using a wide range of apparatus and/or software. It is respectfully submitted that the claims do not need to be limited to any particular method of implementation, and that they recite all the features necessary clearly to define the invention, and to distinguish over the prior art.

10. – 12. The Examiner has rejected certain of the claims as being obvious in view of Spille (US 5,712,920). It is considered helpful briefly to review the present invention and the disclosure of Spille.

Spille relates to the insertion of auxiliary data in a coded data stream. For example, Figure 2 of Spille clearly shows an input signal I being encoded by encoder ENC. Auxiliary data AUX is

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then inserted into the coded audio signal for transmission or storage. Spille also teaches how the auxiliary data can be extracted on decoding the audio signal.

The claimed invention does not concern insertion of auxiliary data in coded data streams. Rather, the invention teaches a method and apparatus for inserting auxiliary data in uncoded data streams. As explained on page 2 of the description, the main data stream, into which the auxiliary data is inserted according to the invention, is subsequently to be coded or alternatively was previously encoded and then decoded, but either way, is an uncoded data stream.

This is somewhat counter-intuitive, but has nonetheless been found by the inventors to offer significant advantages in a number of applications, particularly concerning synchronization.

None of the prior art teaches of the insertion of auxiliary data in a main digital data stream which is subsequently to be coded, or which has previously been decoded, as claimed.

It is therefore respectfully considered that the present invention is novel and non-obvious over the cited art.

Favorable reconsideration is respectfully requested.


To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper,

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including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

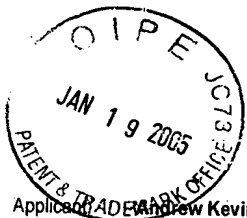
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Docket No.

50060-042Title/Mark: **METHOD FOR INSERTING AUXILIARY DATA IN AN AUDIO DATA STREAM**Serial/Reg./Patent No. **[case_serial_number]**Date Sent: **January 29, 2001**☒ Hand Carried ☐ Fax ☐ 1st-Class Mail ☐ Cert. of Mailing ☐ Express Mail No. _____☒ Transmittal LetterNew Patent App ☐ Utility ☐ Design ☒ Cont. ☐ CIP ☐ Div. ☐ PCT ☐ CPA ☐ RCE ☐ Prov☒ Other: **Under 35 U.S.C 111(a)****18** pages of Specification**6** pages of Claims**0** pages of Abstract**7** pages of Formal/Informal Drawings

Information Disclosure Statement

Form PTO 1449

copies of cited references

jc945 U.S. PTO
09/770296**01/29/01**

- ☐ Trademark/Service Mark/Intent-To-Use Application
- ☐ Amendment to Alleged Use ☐ Statement of Use
- ☐ Formal/Informal/Substitute Drawing Sheet
(no. of) Substitute/Specimens
- ☐ Continued Use Affidavit/Declaration (Section 8 & 15)
- ☐ Notice of Opposition/Answer to
- ☐ Ex Parte Appeal
- ☐ Petition for Cancellation/Answer To
- ☐ Renewal of Reg. No.
- ☐ Combined Declaration/Power of Attorney
- ☐ Letter of Protest
- ☐ Request for _____day/month Extension of Time
- ☐ Request for Non-Publication

- ☒ Preliminary Amendment
- ☐ Response to Missing Parts Notice
- ☐ Certified Copy of Priority Doc
- ☐ Claim for Convention Priority
- ☐ Verified Statement of Small Entity Status
- ☐ Transmittal of Issue Fee: Form PTO 85b
- ☐ Maintenance Fee for _____ years after grant
- ☐ Notice of Appeal ☐ Appeal Brief
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- ☐ Response/Amendment to Office Action of
- ☐ Other

Assignments/Security Agreements/

☐ Petition to Commissioner forCheck for \$ _____ ☒ Charge Deposit Acct. 500417 \$ **1,318.00** Atty Init. **SAB** Tkpr. # **4233** Secy. or PL Init. **klm**CLO2 Descrip.: **1-\$710.00****3-\$608.00**

THE PATENT AND TRADEMARK OFFICE DATE STAMPED HEREON IS ACKNOWLEDGEMENT THAT THE ITEMS, CHECKED ABOVE, WERE RECEIVED BY THE PTO ON THE DATE STAMPED.



Docket No.: 50060-042

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Andrew Kevin MCPARLAND

Serial No.:

Group Art Unit:

Filed: January 29, 2001

Examiner:

For: **METHOD FOR INSERTING AUXILIARY DATA IN AN AUDIO DATA
STREAM**

PRELIMINARY AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D. C. 20231

Sir:

Prior to substantive examination of the above-referenced Application, please amend
the Application as follows:

IN THE SPECIFICATION AND CLAIMS:

Please insert the attached amended pages of specification and claims for the
corresponding pages of specification and claims as filed.

At page 1, line after the title, insert the following subsection:

--Reference to Related Applications

This Application is a continuation of International Application No.
PCT/GB99/02473, whose international filing date is July 29, 1999, which in turn claims the
benefit of Great Britain Application No. 9816518.6, filed July 29, 1998, the disclosures of

Serial No.:

which Applications are incorporated by reference herein. The benefit of the filing and priority dates of the International and Great Britain Applications is respectfully requested.--

REMARKS

Entry of this Preliminary Amendment is respectfully requested.

Respectfully submitted,

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complex proprietary signal processing and are not designed to accommodate further coding of the signal.

The invention aims to provide a method of communicating data or synchronisation information together with a main data signal without unduly affecting the transmission of the main data signal.

In a first aspect, the invention provides a method of inserting auxiliary digital data in a main digital data stream which is subsequently to be coded to produce a coded data stream (or which has been decoded from a coded data stream), the method comprising identifying at least one component of the main data stream which will make substantially no contribution to the coded data stream (or which was not present in the coded data stream) and inserting data from the auxiliary data stream in the or each component.

In this way, the eventual coded data stream will be substantially unaffected by the insertion of the auxiliary data, so there will be no overall degradation or distortion introduced by the extra data. However, the auxiliary data will have been carried "for free" with the main data signal until it reaches the coder. Although the invention will normally be employed in conjunction with data which is to be coded subsequently (in which case the auxiliary data may be removed at or around the time of coding), the invention may be employed with data which has previously been coded but is not necessarily to be coded further; this still provides the advantage that the carrying of additional information cannot degrade the data further as no "real" information is overwritten by the auxiliary data.

A further potential advantage is that, because the insertion of data is based on the principles used in coding, components can be shared between the data insertion apparatus and a coder or decoder, particularly when integrated

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as a unit including a data insertion function and a coding or decoding function, rather than requiring bespoke design. The auxiliary data may be carried further with the coded data stream, but no longer embedded in the main data stream. For example, in the case of coded audio, the coded data format may allow the auxiliary data to be carried directly as data in addition to the coded audio. The auxiliary data is preferably used to assist in choosing coding decisions or in synchronising the coder with a previous coder. The main data signal is preferably an audio signal, but may be a video or other signal.

Whilst the invention is primarily concerned with adding information to a digital main data signal, it is to be appreciated that this digital signal can be converted into other forms; for example a linear PCM digital signal carrying embedded digital data or a synchronisation signal may be converted to analogue form and back again and provided the conversion is faithful, the data may be recovered, or at least the synchronisation signal may be identified.

The method may further include extracting the auxiliary data and coding the main data. At least one coding parameter or decision is preferably based on the auxiliary data.

Preferably coding includes quantising data words corresponding to said main digital data stream or, more preferably, a transformed data stream to a plurality of levels less than the number of levels codable by said data words. The component of the main data stream may corresponds to less significant bits of coded data words which are to be quantised by said coding to one of a predetermined number of levels, the number of levels being less than the number of levels encodable by the data words. For example, if an n -bit word is to be quantised by coding to 2^m levels, where $m < n$, $n-m$ bits may be

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available to carry additional data.

5 Preferably, the change in the data stream effected by insertion of the auxiliary data is substantially imperceptible, for example below (or at) the audible noise floor in the case of audio data or having substantially no perceptible effect on picture quality in the case of a video signal.

Preferably inserting the auxiliary data comprises inserting the data into unused sub-band samples of a transformed set of data.

10 In a preferred application, the main data comprises audio data to be coded according to an MPEG-type audio coding scheme (by which is meant any similar coding scheme based on the principle of quantising a plurality of sub bands or other components into which the signal is analysed) and identifying at least one component comprises identifying sub-bands which are unoccupied or identifying quantisation levels, the auxiliary data being inserted in unoccupied bands or at a level below the quantisation noise floor.

15 This may be provided independently in a related but independent aspect, in which the invention provides a method of inserting auxiliary data into an audio data stream to be coded by analysing the audio data into a plurality of sub-bands and quantising the sub-bands, the method comprising estimating sub-bands and quantisation levels for a subsequent or previous coding and
20 inserting the auxiliary data at a level substantially below the level of estimated quantisation noise.

Estimating sub-bands and quantisation levels may include transforming the (audio) data from the time domain (or an uncoded domain) to the frequency domain (or a coded domain) or otherwise analysing the data into a plurality
25 of subbands, for example using a Fourier or the like transform. Data may be

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inserted in the frequency domain, and the modified frequency domain data may be transformed back to the time domain.

5 A particular advantage arises when the estimated sub bands or quantisation levels correspond directly to sub bands or quantisation parameters which have been or will be used in coding of the data; there is substantially no effect on the coded signal, as the component(s) of the main data signal which are used to carry the auxiliary data would otherwise be lost by the coding process.

10 The data to be carried may comprise a defined synchronisation sequence; this may facilitate detection of frame boundaries and the like and may be employed to facilitate extraction of other data or to minimise degradation between cascaded coding and decoding operations.

The auxiliary data or synchronisation signal may be inserted into an upper subband of the main data.

15 In a further aspect, the invention provides a method of carrying a synchronisation sequence with a main digital data signal, preferably an audio signal, for example a linear PCM audio signal, comprising inserting a defined sequence of synchronisation words into a component of the main data signal, preferably an unused subband, to facilitate identification of or
20 synchronisation with previous coding of the signal.

The invention also provide a method of detecting a frame boundary or establishing synchronisation with a data signal produced by the above method comprising searching for a sequence of synchronisation words in said component of the data signal and comparing at least one value found,
25 or a derived value to a stored sequence of values.

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5 The invention further provides a digital data signal, preferably a linear PCM audio bitstream, comprising an audio signal and at least one of a synchronisation sequence or an auxiliary data signal embedded in an otherwise unused subband or in subbands below an MPEG quantisation noise floor.

The invention extends to apparatus for inserting auxiliary data into a data stream and to data streams coded by the above method.

Embodiments of the invention will now be described by way of example, with reference to the accompanying drawings in which:

10 Fig. 1 shows schematically cascaded MPEG-type coding and decoding transformations;

Fig. 2 shows bit allocation for a typical signal;

Fig. 3 shows scalefactors and the lowest level that can be coded for the signal of Fig. 2;

15 Fig. 4 shows space determined to be available for data transmission in accordance with the invention;

Fig. 5 is an illustration of the effect of 32-sample alignment on an ID sequence

Fig. 6 shows an example synchronisation signal;

20 Fig. 7 shows insertion and extraction of the synchronisation signal.

A preferred application of the invention involves carrying additional data with an audio signal which is to be coded according to MPEG audio coding. The basic principles will be described, to assist in understanding of the invention.

Carrying data with MPEG audio signals -basic principles

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will be practically identical to those that originated in the decoder.

When an encoder encodes the signal it attempts to allocate enough bits for each subband such that the resulting signal is not audibly different from the original.

5 **Selection of components for carrying data**

Given these two properties, we have appreciated that data can be inserted into the subbands below the level of the significant audio signal such that the inserted data is inaudible (or at least not introducing any impairments beyond those of the MPEG encoding).

10 Fig. 2 shows the measured level of the audio in each subband, coded as "scalefactors" in the MPEG audio bitstream. It also shows the bit allocation chosen by an encoder. This is specified as the number of quantisation levels for a particular subband. In the diagram, the bit allocation is represented as a signal-to-noise ratio, in dB terms, to permit representation on the same
15 axis. For this purpose, each bit that is needed to represent the number of quantisation levels is approximately equivalent to 6dB of "level".

● If instead we show the scalefactors and the lowest level that can be encoded with the bit allocation from Fig. 2 we get the graph in Fig. 3.

One can see that the levels below the lowest level are unused. As the MPEG
20 model has determined that there is no audible information below these lowest levels we are free to use them for data.

Given the constraint that we should not interfere with the audio, levels near that of the lowest level will not be used. This should also mean that no clipping problems are introduced. Given also that the signal is probably to be

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appropriate bit-allocation are based on exactly the same signal. In theory this could lead to transparent re-encoding.

5 In this application of the invention, the aim is to insert a specific identification sequence into a subband in a decoder, which will then be embedded in the linear PCM output. A subsequent encoder can use this information to deduce the 32-sample boundaries in the original encoding and/or to deduce the frame boundary upon which the original encoding was based.

10 An advantage of the technique now being described is that deduction is direct from performing a filterbank on the audio. By inserting this identification sequence into an upper subband, the signal will be inaudible and continually present. It could alternatively be inserted into a lower subband, on its own as an identification signal or carried underneath the audio signal. A suitable identification signal could still be decoded after a
15 level change.

Inserting identification sequence

By inserting a suitable identification sequence into a subband, the original values of this sequence will only be recovered exactly when the original 32-sample boundary of the initial analysis filter is matched in the current
20 analysis filterbank. Thus if the PCM audio is offset by something other than 32 samples another unique sequence will be produced. From this the original 32-sample boundaries can be determined. If the sequence is unique across the length of a frame (e.g. 1152 PCM samples for Layer 2, equivalent to 36 consecutive values in 1 particular subband), the frame position can
25 also be easily deduced. An illustrative sequence is shown in Fig. 5.

If a gain change is applied to the PCM audio signal, only the relative levels of

Claims

1. A method of inserting auxiliary digital data in a main digital data stream which main digital data stream is subsequently to be coded according to a defined coding scheme to produce a coded data stream or which main digital data stream has previously been coded according to a defined coding scheme to produce a coded data stream and decoded, the method comprising identifying at least one component of the main digital data stream which will make substantially no perceptible contribution to the subsequently coded data stream or which made substantially no perceptible contribution to the previously coded data stream and inserting data from the auxiliary data stream in the or each component to produce an output data stream carrying the auxiliary data.

2. A method according to Claim 1 wherein the main data comprises audio data to be coded according to an MPEG-type audio coding scheme and identifying at least one component comprises estimating sub-bands which are unoccupied or estimating quantisation levels, the auxiliary data being inserted in unoccupied subbands or at a level below (or at) the quantisation noise floor.

3. A method of inserting auxiliary data into an audio data stream which audio data stream is subsequently to be coded according to a defined coding scheme by analysing the audio data into a plurality of sub-bands and quantising the sub-bands or which audio data stream has previously been coded according to said defined coding scheme and decoded, the method comprising estimating sub-bands and quantisation levels for a subsequent or previous coding and inserting the auxiliary data at a level substantially below

the level of estimated quantisation noise.

4. A method according to Claim 1, further comprising coding the output data stream.

5. A method according to Claim 4, comprising adjusting or selecting at least one parameter or decision associated with said coding in dependence on data from the auxiliary data stream.

6. A method according to Claim 4 wherein the auxiliary data is extracted prior to or during said coding.

7. A method according to Claim 1 wherein coding includes quantising data words corresponding to said main digital data stream, or a transformed version thereof, to a plurality of levels less than the number of levels codable by said data words.

8. A method according to Claim 2 wherein estimating sub-bands and quantisation levels includes transforming the audio data from the time domain to the frequency domain.

9. A method according to Claim 8 wherein the auxiliary data is inserted in the frequency domain to produce modified frequency domain data, and the modified frequency domain data is transformed back to the time domain.

10. A method according to Claim 1, including decoding a previously coded data stream to generate said main digital data stream, wherein identifying the or each component or estimating sub-bands and quantisation levels is based on information concerning the previous coding.

11. A method according to Claim 1 wherein the auxiliary data is used to establish synchronisation with or to maintain consistency with a previous coding of the main data stream.

5 12. A method according to Claim 1 wherein the auxiliary data to be carried includes a defined synchronisation sequence.

13. A method according to Claim 1 wherein the main digital data stream has at least one upper subband and wherein the auxiliary data or synchronisation signal is inserted into a said at least one upper subband.

10 14. A method of carrying a synchronisation sequence with a digital audio signal which digital audio signal has previously been coded according to a defined coding scheme, the method comprising inserting a defined sequence of synchronisation words into a component of the digital audio signal to facilitate identification of or synchronisation with previous coding of the signal, the component being chosen so that the sequence is substantially
15 imperceptible.

15. A method according to Claim 14 wherein the sequence comprises at least 4 words.

20 16. A method of detecting a frame boundary or establishing synchronisation with a data signal produced by Claim 14 comprising searching for a sequence of synchronisation words in said component of the data signal and comparing at least one value found, or a value derived therefrom, to a stored sequence of values.

17. A method according to Claim 1, wherein the auxiliary data or the

synchronisation sequence is inserted at a decoder which generates the main digital data signal/the audio data stream/the digital audio signal from a previously coded signal.

18. A digital data stream produced by a method according to Claim 1.

5 19. An uncoded digital data stream, preferably a linear PCM audio bitstream, comprising an audio signal and at least one of a synchronisation sequence or an auxiliary data signal embedded in an otherwise unused subband or in subbands below an MPEG quantisation noise floor of a coding process.

10 20. Apparatus for inserting auxiliary data into a data stream comprising:
an input module for receiving a main digital data stream which main digital data stream is subsequently to be coded according to a defined coding scheme to produce a coded data stream or which main digital data stream has previously been coded according to a defined coding scheme to produce
15 a coded data stream and decoded;

a selection module for identifying at least one component of the main data stream which will make substantially no perceptible contribution to the subsequently coded data stream or which made substantially no perceptible contribution to the previously coded data stream; and

20 an insertion module for inserting auxiliary data in the or each component to produce an output data stream carrying the auxiliary data.

21. Apparatus according to Claim 20 wherein the selection module comprises an estimator for estimating sub-bands which are unoccupied or an estimator for estimating quantisation levels of an MPEG-type audio coding
25 process.

22. Apparatus according to Claim 20 wherein one or more of said input module, selection module and insertion module are implemented at least partially in software by a processor.

23. Apparatus for inserting auxiliary data into an audio data stream which audio data stream is subsequently to be coded according to a defined coding scheme by analysing the audio data into a plurality of sub-bands and quantising the sub-bands or which audio data stream has previously been coded according to said defined coding scheme and decoded, the apparatus comprising:

an estimation module for estimating sub-bands and quantisation levels for a subsequent or previous coding; and

an insertion module for inserting the auxiliary data at a level substantially below the level of estimated quantisation noise.

24. Apparatus according to Claim 22 wherein the estimating module includes a transform module for transforming the audio data from the time domain to the frequency domain.

25. Apparatus according to Claim 24 including a modification module for inserting the auxiliary data in the frequency domain to produce modified frequency domain data and a reverse transform module for transforming the modified frequency domain data back to the time domain.

26. Apparatus according to Claim 20 comprising a decoder for decoding a previously coded data stream to generate said main digital data stream or said audio data stream.

27. Apparatus according to Claim 26, wherein the estimation module is

arranged to use information concerning the previous coding.

28. Apparatus according to Claim 26 arranged to insert auxiliary data for use in establishing synchronisation with or maintaining consistency with a previous coding of the main data stream.

5 29. Apparatus according to Claim 20 arranged to insert a defined synchronisation sequence as at least part of the auxiliary data.

30. Apparatus according to Claim 20 arranged to insert the auxiliary data or synchronisation signal into an upper subband of the main digital data stream.

10 31. Apparatus for processing a digital audio signal which digital audio signal has previously been coded according to a defined coding scheme, the apparatus comprising means for inserting a synchronisation sequence comprising a defined sequence of synchronisation words into a component of the digital audio signal to facilitate identification of or synchronisation with
15 previous coding of the signal, wherein the component is chosen so that the inserted data will be substantially imperceptible.

32. Apparatus according to Claim 31 wherein the sequence comprises at least 4 words.

20 33. Apparatus according to Claim 20, further comprising a coder for coding the output data stream.

34. A coder for coding a digital data stream produced by a method according to Claim 1 arranged to extract said auxiliary data prior to or as part

of coding the signal.

35. A coder according to Claim 34 including means for adjusting or selecting at least one parameter or decision associated with coding in dependence on data from the auxiliary data stream.

- 5 36. Apparatus for detecting a frame boundary or establishing synchronisation with a data signal produced by a method according to Claim 12 comprising means for searching for a sequence of synchronisation words in said component of the data signal and comparing at least one value found, or a value derived therefrom, to a stored sequence of values.

Abstract of the Disclosure

Auxiliary digital data are inserted into a main digital data stream, to be subsequently coded to produce a coded data stream, by identifying a component of the main data stream that will make substantially no contribution to the coded data stream. It is into this component that data from the auxiliary data stream is inserted. The main digital data stream may comprise MPEG coded audio data, and the component (which represents unoccupied sub-bands or being at a level at or below a quantization noise floor) identified by estimating sub-bands that are unoccupied, or estimating quantization levels.